TM 501B

INSTRUCTION MANUAL

DISTORTION MEASURING SET
DMS-3 SERIES

ATLANTIC RESEARCH CORPORATION

TELEPRODUCTS DEPARTMENT

ALEXANDRIA, VIRGINIA 22314
USA

ATLANTIC RESEARCH CORPORATION
TELEPRODUCT®
ALEXANDRIA, VIRGINIA 22314

TM 501B

PRICE: $5.00

DISTORTION MEASURING SET

DMS-3 SERIES

Applies to Units Having Serial Numbers of the D Series

August 1972

From the TELEPRODUCT® Line

of the

Teleproducts Department

Manufactured by

ATLANTIC RESEARCH CORPORATION
Alexandria, Virginia 22314
USA

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Figure 1-1. Distortion Measuring Set DMS-3-10.

SECTION I

GENERAL DESCRIPTION

The Distortion Measuring Set, DMS-3 Series, is a portable instrument used in making teleprinter and data set station measurements. It is packaged in an impact-resistant metallic case. The DMS-3 measures bias, maximum distortion, and loop current. The DMS-3 is available in 14 models for various options of signal speed and type. Table 1-1 lists the models available and enumerates the mode options for each model. Table 1-2 lists the DMS-3 specifications.

As normally furnished, the set is battery operated; however, the Model PS-2 ac power supply is available and may be directly substituted for the battery either at the factory or in the field.

For BIAS measurements, the meter indication will follow changing signal conditions, permitting accurate adjustment of terminal equipment and teleprinter bias controls. MAX DSTN readings hold for a considerable length of time until reset. The SIGS setting provides a means of observing the line condition, idle (marking), open (spacing), or incoming signals (alternating meter indication). When the PS-2 power supply is used, the lamp in the RESET switch will also indicate the line condition.

The polar voltage input feature provides for measurements at a data subset interface.

Table 1-1. DMS-3 Model Variations.

MODEL VARIATION NO.			-2	-3*	-4	-6	-7	-9	-10*	-11	-12	-13	-14	-15	-16	-17
SPEED (baud)		20.0 (for dialing checks)				X										
		37.5 (military crypto)	X	X	X	X	X		X	X	X					X
		45.5 (60 wpm, 5-level; 53 wpm, 6-level)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		50.0		X	X	X	X		X	X	X	X	X	X	X	X
		56.9 (75 wpm, 5- level; 66 wpm, 6-level)	X	X	X	X	X	X	X	X	X			X	X	X
		61.1 (military crypto)	X	X	X	X	X		X	X	X			X	X	X
		66.7		X					X					X	X	X
		74.2 (100 wpm, 5-level)	X	X	X	X	X	X	X	X	X			X	X	X
		75.0 (100 wpm, 5-level)									X	X	X			
		80.0												X		
		82.5													X	
		96.0											X			
		100					X									
		110 (100 wpm, 8-level)	X	X	X	X	X	X	X	X	X			X	X	X
		120					X									
		133.2								X						
		135 (134.46)		X					X					X	X	X
		150		X					X					X	X	X
		192.0											X			
		Other speeds are available on special order														
INPUTS ACCEPTED	Low Impedance: Input Current (milliamperes) Polar	10, or greater	X	X	X	X	X	X	X	X	X		X	X	X	
		5										X				X
	Neutral	20	X		X	X	X	X	X	X	X	X		X	X	
		40											X			
		60										X				
		62.5			X	X	X	X	X	X	X		X	X	X	
		70	X	X												
		110		X												
	Low Level Input	>65 K Ω input for EIA-RS232 and MIL-188 interfaces	X	X	X	X	X		X	X	X		X	X	X	

*Standard model

Table 1-2. Specifications, DMS-3.

Input Signals Accepted	See Table 1-1. Polar (>10 mA) Neutral (20 - 150 mA) EIA or MIL-STD-188
Speeds	See Table 1-1. 20 to 300 baud, standard, up to 11 discrete speed selections (higher speeds available).
Code Formats	All, including start-stop or synchronous
Precision	±2 1/2 percent distortion (up to 30 percent)
Input Impedance	
Loop Input	60 ohms noninductive, shunted with 11 microfarads nonpolar capacitor (FIL switch removes capacitor for bounce measurements)
Polar Voltage Input	68,000 ohms
Direct-Reading Meter	
Size	2 1/2 inch dial
Calibration	Bias (center reading): 30 percent Space to 30 percent Mark Total distortion: 0 percent to 35 percent Loop current: 0 to 150 milliamperes Battery life: new, good, 8 hours, or bad Signals: space or mark
Weight	2 pounds
Size	3 1/2 inches by 6 1/4 inches by 3 5/8 inches (including protective panel cover)*
Battery Required	Type B, 22-volt
Battery Life	100 hours intermittent use
Optional Accessory	Power Supply PS-2 (ac)

*The DMS-3-9 has a larger cover to hold an input cord. It measures 3 7/8 by 6 1/2 by 4 3/8 inches.

SECTION II

INSTALLATION

No preparation for use is required for the Distortion Measuring Set DMS-3 other than to determine that adequate power is available and that the instrument has been calibrated within the six-month period specified, or as required by any component replacement. Refer to Paragraph 3-2 for a battery check procedure. If the set is equipped with the PS-2 ac power supply, be sure that it is connected to a 115-volt power source. Section V provides calibration information.

SECTION III

OPERATION

3-1. Controls and Indicators. Table 3-1 lists the controls and indicators used in the operation of the DMS-3.

Table 3-1. DMS-3 Controls and Indicators.

Control or Indicator	Position	Function
Meter	LOOP MA scale	Registers loop current in milliamperes if selector switch is in LC position.
	BIAS scale	Registers percent bias (average displacement of space-to-mark transistions) if lever switch is in BIAS position. Readings to the left of center indicate spacing bias (space pulses lengthened by delay of space-to-mark transition). Readings to the right of center indicate marking bias (mark pulses lengthened by advance of space-to-mark transition).
		Indicates signal status if lever switch is in SIGS position. A fluctuating needle indicates signal present at the input. An S reading indicates spacing input (open circuit). An M reading indicates marking input (idle line).
	BATTERY scale	Indicates battery condition if a plug is inserted in LOOP INPUT jack and selector switch is in B position.
	DISTORTION scale	Registers maximum total distortion if lever switch is in MAX DSTN position.
Speed switch, S2	--	Sets instrument to measure signals of indicated speed.

Table 3-1. DMS-3 Controls and Indicators. (Cont'd).

Control or Indicator	Position	Function
Selector switch, S1	LC	Sets instrument to measure signal current.
	P	Sets instrument to accept polar, EIA, or MIL-188 signals.
	Number	Sets instrument to accept neutral signals of indicated loop current.
	B	Sets instrument to measure battery or power supply condition.
Lever switch, S4	BIAS	Sets instrument to measure signal bias.
	SIGS	Sets instrument to monitor signal condition.
	MAX DSTN	Sets instrument to measure peak distortion of any type.
RESET momentary switch, S5		When pushed, resets maximum distortion measuring circuit.
Signal indicator lamp		Operates only if DMS-3 is equipped with PS-2 ac power supply.
	Lighted	Indicates signal input is spacing.
	Unlighted	Indicates signal input is marking.
	Blinking	Indicates that lamp is following signal containing both mark and space bits.
FIL/CAL pushbutton	Pushed	When pushed, removes 11-microfarad capacitor from input circuit.
	Unpushed	Connects 11-microfarad capacitor in parallel with input jacks for filtering small amounts of "bounce" or noise in input signal.
LOOP TIP switch, S3	+	Connects tip of LOOP INPUT jack to positive side of measuring circuitry.
	–	Connects tip of LOOP INPUT jack to negative side of measuring circuitry.

Table 3-2. DMS-3 Jacks.

Jack	Used for
POLAR VOLTAGE jacks	Connection of low voltage polar signal inputs. For MIL-188 signals connect signal line to red POLAR VOLTAGE + jack and connect signal ground to black POLAR VOLTAGE – jack. For EIA signals, connect signal line to black POLAR VOLTAGE – jack and signal ground to red POLAR VOLTAGE + jack.
LOOP INPUT jack	Connection of neutral or high-voltage polar signal inputs. Polarity of input may be controlled by LOOP TIP switch. Internal battery is connected to instrument circuits only if a plug is inserted in LOOP INPUT jack.

3-2. Connection Instructions.

Neutral or Polar Signals. If neutral or polar signals are to be measured, use the following procedure.

a. Connect LOOP INPUT jack of the DMS-3 in series with the circuit to be measured. If polar signals are to be measured, it is important that the LOOP TIP switch be positioned in accordance with the plug polarity. If neutral signals are to be measured, plug polarity may be controlled by the polarity switch for convenience.

b. To check polarity of the connection, set selector switch in the LC (loop current) position. If LOOP TIP switch is in correct position, meter will indicate average current in loop.

c. Set selector switch in the B position to check battery condition. A new battery will read toward full scale to the left on the BATTERY scale of the meter. The single line indicates an aged battery capable of providing approximately 8 hours of continuous operation. If the reading is in the black area, the battery should be replaced (use Burgess Type XX15).

EIA or MIL-188 Signals. If low-voltage polar signals are to be measured, use the following procedure.

a. Insert a dummy plug (unterminated) in the LOOP INPUT jack. This dummy plug is required to connect the battery to the instrument measuring circuitry.

b. Connect POLAR VOLTAGE jack of the DMS-3 in parallel with the circuit to be measured. It is important that the polarity be presented properly to the instrument. For MIL-188 signals (positive marking, negative spacing), connect the signal line to the red POLAR VOLTAGE + jack and the signal ground to the black POLAR VOLTAGE – jack. For EIA signals (negative marking, positive spacing), connect the signal line to the black POLAR VOLTAGE – jack and the signal ground to the red POLAR VOLTAGE + jack.

c. To check polarity of the connection, set lever switch in the SIGS position and verify that a marking signal causes the meter to deflect to the right (M) and a spacing signal causes the meter to deflect to the left (S).

d. Set selector switch in the B position to check battery condition. (See step c of Neutral or Polar Signals connection procedure.)

3-3. Loop Current Measurement Procedure. To measure loop current accurately, the circuit must be idle. Average loop current measurements may be made on active circuits. To measure loop current, set the selector switch in the LC position and read loop current on the LOOP MA scale of the meter.

3-4. Maximum Distortion Measurement Procedure. To measure maximum signal distortion, use the following procedure.

a. Set the selector switch to the proper setting for the circuit to be measured (P for polar, EIA, or MIL-188 signals, or loop-current rating for neutral signals).

b. Set the speed switch to the signal speed of the circuit to be measured.

c. Set the lever switch in the SIGS position to check that there are signals on the line. The meter will oscillate if signals are being received, or will display the loop condition as mark (if idle) or space (if open) on the BIAS scale. If the instrument is equipped with the optional ac power supply, a constant indication of signals is given by the signal indicator lamp.

NOTE

The DMS-3 uses mark-space balancing circuits requiring that the signals measured contain a miscellaneous arrangement of unit element marks and spaces. The DMS-3 is therefore intended for the measurement of repeated characters or short messages in which one type pulse does not greatly over-balance the other. The instrument may be used to make bias adjustments from reversals (dot cycles) but the total distortion measurement will tend to be a few percent high in the measurement of reversals.

d. Set the lever switch in the MAX DSTN position. Push the RESET switch momentarily, and read the percent total distortion from the DISTORTION scale of the meter. During the measurement process, it is desirable to operate the RESET* switch momentarily from time to time to prevent the meter from maintaining its highest distortion reading for a period after the distortion level is reduced.

3-5. Bias Distortion Measurement Procedure. To measure signal bias, use the following procedure.

a. Set the switches as required (steps a, b, and c of Paragraph 3-4).

b. Set the lever switch in the BIAS position and read the percent bias from the BIAS scale of the meter (marking to the right and spacing to the left).

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*The RESET switch does not normally return the meter to exactly 0 percent when operated.

c. Hold the FIL/CAL switch down if it is desired to remove input filter circuit. Meter will indicate excessive distortion if signals contain bounce or noise.

d. When measurements are completed, remove the plug from the INPUT jack, thereby disconnecting the battery.

SECTION IV

THEORY OF OPERATION

4-1. Overall Functions. There are four basic circuits in the DMS-3.

1. The input amplifier determines the input loop circuit sensitivity range.

2. The measuring circuit generates a voltage pulse, the amplitude of which is directly proportional to the degree of distortion in the signal. Two of these circuits are used. One measures marks, the other measures spaces.

3. The differential amplifier drives the indicating meter. The difference between the average marking distortion and the average spacing distortion gives the bias measurement. Both mark and space distortion signals are fed into one input of the differential amplifier for a total distortion measurement.

4. The voltage regulated power supply furnishes a constant 13 volts to all active circuits in the DMS-3. A schematic diagram of the DMS-3 is included in Section VI.

4-2. Input Amplifier. A precision 60-ohm resistor, R201, is inserted into a neutral or polar test signal loop via J1. The loop current develops voltage across R201 which is applied to transistor Q1. When the input signal is mark, a positive potential must be present at the base of Q1. Switch S3 reverses the polarity of the input signal where the normal negative tip operation does not exist.

A negative potential is provided to the base of Q1 through switch S1A and resistors R102 and R106 for 60 mA, R103 and R107 for 20 mA. These resistors are selected to provide a negative potential at the base of Q1 which equals the positive potential supplied by the loop signal through R203. When the loop signal is at or above its mid (one-half) current value, Q1 will be non-conducting (for the marking input current condition). When the loop current is less than its one-half current value, Q1 will be conducting (for the spacing input condition). For polar operation, Q1 will switch at zero volts (which is one half the symmetrical polar current or voltage signal).

Q2 is driven directly from Q1. When Q2 conducts, current is supplied through CR3 and R7 to turn on Q3. The potential at the junction of CR1 and R4 is near -1 volt which is sufficient to turn off Q4. The collector of Q3 is at -13 volts and current is supplied through R13 to turn on Q6. Q5 is turned off due to insufficient current through R16. Q3 and Q5 collectors are in opposite states, e.g., Q3 is at -13 volts and Q5 is at ground. Q4 and Q6 are in opposite states with the collector of Q6 being at zero volts and the collector of Q4 being at -13 volts.

4-3. Measuring Circuit. The space measuring circuit is composed of C5, C6, CR10, CR11, CR12, R20 and the selected speed resistor connected to speed switch S2. The mark measuring circuit is composed of C2, C3, CR5, CR6, CR9, R12, and the selected speed resistor switch S2.

In the marking condition, the mark measuring circuit (specifically C2) charges from -13 volts through CR8, R11, Q3, R10, and CR5. When a space pulse is received, Q4 conducts which causes a +13-volt potential to appear at the cathode of CR5. One-half of the 13-volt potential is absorbed by C3 which charges through R12. The positive potential (approximately 5 volts) at the cathode of CR5 forward biases CR6 and is discharged through the selected speed resistor toward -13 volts. For marking distortion (marking bias) the space pulse will be short and the positive potential at CR5 will not have been dissipated. When the signal returns marking after the space pulse, Q3 again conducts which snaps the cathode of CR5 to ground and C3 transfers the previous positive charge as a negative pulse through CR9. The space measuring circuit operates in a similar manner. Resistor R11 equalizes the voltage potential supplied to C3 (marking circuit) and C5 (space circuit) and also counteracts the difference in the diode voltage drops of CR6, CR11, as well as variations in other components.

4-4. Differential Amplifier. The differential amplifier is composed of two identical channels of amplification. An input pulse from the measuring circuits appears at the base of Q13, is amplified, and is then fed to the high impedance input of Q12. C9 stores this pulse. The output of Q12 is a dc level and is further amplified by Q11 to drive the meter. Transistor string, Q8, Q9, and Q10, performs in a like manner. R36 permits a zero balance to equalize the parameter variations between the two parts of the circuit.

4-5. Bias Measurement. For bias measurements, the mark-measuring pulse is supplied to Q13 and the space-measuring pulse is supplied to Q8 through S4A. The output of Q10 and Q11 will be equal for equal amounts of marking and spacing (bias) distortion. If the signal contains more marking bias, the output of Q11 will be more negative than the output of Q10, and the meter will be driven toward the marking bias side of the bias meter scale. Conversely, a spacing bias signal will generate a more negative potential at the output of Q10 than Q11, and the meter will deflect in the opposite direction toward the spacing side of the scale. R32 is used to adjust the current through the meter for calibration at 30 percent.

4-6. Total Distortion Measurement. For total distortion readings, the outputs from both the mark and space measuring circuits are connected to Q13 and a dc reference voltage is supplied to Q8 by R101, R105, and CR101. For zero percent distortion, the reference potential causes Q10 to become more negative than Q11 in order to deflect the meter full scale to the left. As the distortion increases to 20 percent, Q11 reaches the potential of Q10. Therefore, there is no current through the meter at 20 percent distortion, and R33 in series with the meter has no effect. R101 is adjusted for proper 30 percent distortion reading on the meter. A larger capacitor C10 is switched into the Q12 circuit to hold the charge longer. This causes the total distortion reading to hold upscale longer on the meter.

4-7. Battery Test Circuit. The battery test circuit is basically a dual emitter follower with the reference voltage provided by zener diode CR18. The zener current is supplied by R43. In the battery test position, the meter is used to measure the difference between the battery voltage and the regulated output voltage. R205 is the multiplier resistor for the voltmeter circuit. When the voltage across Q14 drops below approximately 1 volt, the regulator circuit ceases to function efficiently. The black area on the battery scale of the meter indicates when the battery is too low for proper operation.

4-8. Auxiliary Circuits. In the SIGS position of the lever switch, the meter movement is used as a voltmeter to measure the voltage at the input amplifier (Q3 and Q4) through meter multiplier resistor R6 for mark and R5 for space. The meter will deflect toward the mark or space side of the bias scale to indicate a marking or spacing input signal condition.

Loop current measurement is made by measuring the voltage drop across resistor R201. In this mode, R24 is the voltage multiplier. For zero input loop current, the meter is deflected to the left by the voltage developed by R23 and R24 and is stabilized by the Q8, Q9, and Q10 amplifier string.

Power is supplied to the DMS-3 by the battery through a contact on the input jack, J1, only when a plug is inserted in the jack.

Small amounts of noise on the signal are filtered by C201. A larger filter capacitor C202 may be deleted by operating the FIL/CAL switch S6 to read distortion caused by excessive relay bounce.

The storage capacitors C8 and C9 (and C10 on distortion) are discharged rapidly when the reset switch is operated.

SECTION V

MAINTENANCE

5-1. Maintenance Requirements. The DMS-3 requires no routine maintenance. However, the instrument should be calibrated every six months or after a component has been changed. Calibration procedures are given in Paragraphs 5-4 through 5-7. Repair should be limited to replacement of modules or plug-in components. A troubleshooting procedure is given in Paragraph 5-8.

5-2. Equipment Required for Calibration. The preferred source of calibration signals is a device capable of producing a FOX MESSAGE without jitter, "holes", or other distortion, and with the capability of introducing controlled amounts of marking and spacing bias up to 30 percent without end distortion. The Atlantic Research Test Message Generator TMG-10 or TMG-16 is such a device. The Atlantic Research Test Message Generator TMG-2 or TMG-3 is a 2-character generator which may be used in calibrating the DMS-3, using the repeated characters "R" and "Y".

NOTE

When using the repeated characters "R" and "Y" for calibration, the following adjustment compensation should be made. Adjust "TOTAL DSTN" 2 percent HIGH at 0 percent and 30 percent. Adjust BIAS 1 percent HIGH at 30 percent.

A teletype transmitter operating with a bias-distortion set may also be used. It is strongly recommended that prior to the use of any signal source and distorting set for calibration, its signals be checked with the best available teletype distortion analyzing standard, and that any bias or distortion found to be present in the calibration signals be taken into consideration in making any DMS-3 calibration adjustments.

Any type of calibrating set can be used which utilizes mark space balancing circuitry requiring the measurement of transmission containing both unit-element marks and spaces.

5-3. Disassembly Procedure. To disassemble the DMS-3 for calibration or troubleshooting, use the following procedure.

CAUTION

If set is equipped with 115-Vac power supply, unplug line cord before removing set from case.

a. Remove four screws from the sides of the instrument case. If set is not equipped with ac power supply, as panel is slipped out of its case, it may be necessary to remove the cable hole plug. The instrument may then be completely removed from its case.

b. Remove three screws from the large printed-circuit board and carefully fold it away from the set, laying it upon a well-insulated surface with its component side up. This will permit its calibration potentiometers to be readily adjusted without rotating the set and disturbing the meter reading. The set should rest with the panel perpendicular to the bench surface.

CAUTION

Be aware of the shock hazard whenever the DMS-3 is operated outside its case. Do not touch input jack terminals, which expose loop battery. If set is equipped with 115-Vac power supply, avoid contact with exposed fuse clips.

5-4. Calibration. Under normal circumstances, the calibration procedures should begin with all potentiometers set as they were when the set was received for calibration. After replacement of a major component, however, or difficulty in making the calibration, it is recommended that all calibration potentiometers be initially adjusted to mid-range and the entire set of procedures followed step-by-step.

1. Mechanically center meter zero and all pots on Board "A."

2. Install battery and connect to instrument.

3. Position speed switch to mid-range of Baud speeds available, distortion switch to Max Dstn, and tip switch to negative.

4. Move mode switch to "B" and insert plug into jack, observing that meter reads at extreme left of meter scale or slightly up-scale, depending upon battery condition.

5. Set signal source to Mark Hold at 60 mA, mode switch to "LC" and adjust LC pot R24 if necessary to make pointer read 60 mA.

NOTE

Sigs lamp remains off.

6. Check LC readings at 20 mA and 100 mA after setting 60 mA, readjusting if necessary for equal differences at the low and high current markings.

7. Set signal source to Fox signals; mode switch of DMS to 60, and set for zero percent distortion.

NOTE

Units are usually calibrated on Fox signals but can also be peaked up on "RY" or other type of character arrangement.

8. Set distortion switch to "BIAS," observing that pointer moves to center or zero of scale. Adjust "0 percent BIAS" R36 if necessary.

9. Now set distortion to 30 percent Mark Bias and adjust "30 percent BIAS" pot R32 if necessary to make pointer rest on 30 percent position of scale.

10. Check 0 percent Bias again, readjusting R36 if necessary and then change distortion to space bias. A slight change should be indicated in the direction of the type of bias distortion selected.

11. A variation in readings will be due to a slight maladjustment of the "Mark-Space Balance" which will be adjusted later in the procedure.

12. Move mode switch to LC and recheck "LC" reading at this time at 60 mA and readjust if necessary to obtain an exact reading. Return mode switch to 60 position.

13. Move distortion switch to "SIGS" and observe that meter pointer will move in accordance to signal being measured. More action of pointer will be observed at low speeds whereas pointer will not be capable of responding to higher Baud rates.

14. Move distortion switch to Max DSTN and with zero distortion adjust the "30 percent total" R101 so that pointer comes to rest on left-hand index of meter scale. Signal should be standard FOX rather than RY. Also ascertain that signal source is producing true negative mark for EIA and observe that sigs lamp will be flashing on and off with signal.

15. Set distortion to 20 percent Mark Bias and observe where pointer rests on meter scale. If reading is less than 20 percent, note the actual distance in number of divisions on scale and divide by two; then change distortion to zero and reset instrument to zero. Adjust "30 percent TOTAL" R101 to move pointer upscale the number of divisions found by dividing by two, then adjust "0 percent total" to bring pointer back to zero. This increases the gain (clockwise decreases gain and counterclockwise increases gain). If readings are greater than 20 percent reverse the procedure of above.

16. Now with 30 percent Mark distortion, observe where pointer comes to rest and change distortion to Space bias and note the difference in readings. Readjust "Mark-Space Balance" R11 so that there is no difference in readings between mark or space bias.

17. At this point, return to step 8 and check 0 percent and 30 percent positions for both Mark and Space. If readings are equal, continue to next step but if there is a difference, readjust as necessary.

18. Move distortion switch to Max and apply an "RY" signal. Depress Fil/Cal switch and observe if a difference exists at 30 percent distortion. Readjust Neutral pot R102 if necessary so that no difference exists. Move mode switch to 20 and apply a 20 mA signal, adjusting R103 so that no difference in readings is noticed when fil/cal switch is depressed.

19. Change signal type to Polar, mode switch to P, and adjust R104 as required to the same conditions as above. Not too much adjustment will be observed in the polar mode.

20. Remove polar signal and insert an EIA signal into red and black "polar voltage" Test Points. A dummy plug will also have to be inserted in the loop jack to turn on power. With the correct polarity as indicated by the color of the test points, it will be observed that Mark Bias actually reads Space Bias and vice versa but this is normal; these readings being observed in the Bias mode.

21. At this Point, set mode switch to 60, distortion switch to Max Dstn, speed switch to slowest speed, and apply a 30 percent Mark bias signal. Readings should be with 2 1/2 percent. Proceed from the lowest to the highest speed of the instrument ascertaining that the headings all fall within the prescribed plus or minus 2 1/2 percent. (Pointer will move about at the low speeds and readings should be averaged.)

22. Install DMS into case.

5-5. Procedure for Troubleshooting. No special troubleshooting techniques are required to maintain the equipment. If a defective component is located and replaced, the calibration procedure should be rerun to verify proper operation.

Troubleshooting can be performed by using Multimeter AN/PSM-6, Electronic Voltmeter HP-403B, or Oscilloscope, Tektronix 454. The oscilloscope is used when special circuit problems demand a more detailed examination of the waveshape and amplitude of the test signal.

Before proceeding with the troubleshooting, insert a dummy phone jack in the LOOP INPUT jack (or use the normal connecting cable with nothing connected to the outer ends). This applies power to the instrument. Rotate the selector switch to B and check battery condition (Paragraph 3-2). Examine and replace the power source for the DMS-3 if necessary.

Table 5-1. Troubleshooting Chart.

Symptoms	Probable Cause	Remedy
1. Meter does not move when making battery check	a. No dummy plug inserted in LOOP INPUT jack.	a. Insert dummy plug or normal patch cable with no connection on other end.
	b. -13 VDC regulator circuit inoperative.	b. Transistor Q14 or Q15 shorted. Diode CR 18 open. Replace defective component.
	c. Meter defective.	c. Replace Meter M1.
2. Meter reads to right of center when making battery check.	Battery connection is backwards in troubleshooting hookup.	Reverse power input wiring.
3. Meter pegs to left when making battery check.	a. More than 20 Vdc is being applied to power input terminals.	a. Reduce supply voltage to -20 Vdc.
	b. -13 Vdc regulator circuit defective.	b. Transistor Q14 or Q15 open. Diode CR 18 shorted. Replace defective components as necessary.
4. With selector switch in LC, meter does not read zero.	a. Loop current amplifier inoperative.	a. Check transistors Q8, Q9, and Q10. Replace defective component.
	b. LC adjust potentiometer misadjusted.	b. Adjust R 24 (Paragraph 5-5).
5. With selector switch in P and lever switch in BIAS, meter is not centered at 0 on BIAS scale.	Bias amplifier inoperative.	Check transistors Q11, Q12, and Q13. Replace defective component.

Table 5-1. Troubleshooting Chart. (Cont'd)

Symptoms	Probable Cause	Remedy
6. With selector switch in SIGS and +6 Vdc applied to POLAR VOLTAGE red jack (with ground on black jack), meter does not read M on BIAS scale	a. Loop current amplifier inoperative.	a. Check transistors Q8, Q9, and Q10. Replace defective component.
	b. Distortion amplifier inoperative.	b. Check transistors Q1, Q2, Q3, Q4, Q5, Q6, and Q7. Check diodes CR1 through CR12. Replace defective component.
7. With selector switch in SIGS and -6 Vdc applied to POLAR VOLTAGE red jack, meter does not read S on BIAS scale.	a. Loop current amplifier inoperative.	a. Check transistors Q8, Q9, and Q10. Replace defective component.
	b. Distortion amplifier inoperative.	b. Check transistors Q1, Q2, Q3, Q4, Q5, Q6, and Q7. Check diodes CR1 through CR12. Replace defective component.

NOTE

Problems occurring in function switch positions 20 and 60 can be investigated by using the P Position in the above chart.

SECTION VI

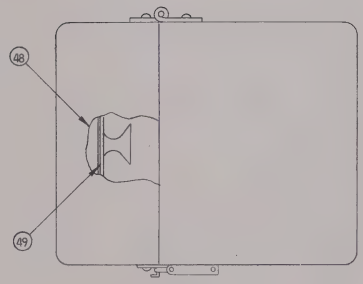
DRAWINGS

REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHK	APPD
A	ADDED -9 COLUMN PER DCN #377.	12-22-65	FPF	ESD	
B	ADDED VIEW A, DELETED ITEM 33 & 34. FROM 3C-9. DCN #407	5/5/66	FPF	ESD	
C	B-4, ADDED -1 OPTION. DCN #417	6-9-66	I	ESD	LW
D	ITEM 5 WAS TERMINAL, EDGE TYPE, BRASS #42587-2 ITEM 38 WAS TUBING, INSULATION, HEAT SHRINKABLE, GREEN, SIZE 3/16. REVISED PER DCN #460. AFFECTS ALL UNITS FROM RUN #3449 ON.	1-6-67	JJ	ESD	AR
E	ITEM 47 WAS DWG. NO. TP-DA-40779425 (SHTS 1 & 4). DCN #521.	8/15/67	E.P.	ESD	
F	ITEM 16 WAS METER, TYPE 227PL PER DCN #582. AFFECTS UNITS FROM S/N C1061 ON.	6/19/69	ESD		
G	REMOVED SLOTS FROM BATTERY BRACKET. ADDED NOTE 3 AND ITEM 50.	8/7/69	JDW		AR
H	LETTER C DELETED FROM DMS-3C SERIES DESIGNATION. DCN #787.	11/19/69	ESD		AR
I	ADDED NOTE 4, ITEM 51, & ITEM 26. QTY OF ITEM 25 WAS 2. EN #899	2/25/70			AR
J	DELETED ITEM 27 & 46. ITEM 42 QTY. WAS 3. EN 1075A	9-14-70	PES		AR

COMPONENT DESIGNATION			
REF. DESIG	ITEM	FROM	TO
R201	35	J1, PIN 1	J1, PIN 2
C202	36	S6	S3, PIN 1
C201	37	S3, PIN 6	S3, PIN 3
STRAP	44 & 45	S3, PIN 6	S3, PIN 1
STRAP	44 & 45	S3, PIN 3	S3, PIN 4

(CONTINUED ON SHEET 2 OF 2)

DESCRIPTION	REF DESIG	MANUFACTURER
CHINE, SKT, BUTTON HD, STEEL, 2 X 1/4 LG., BLACK ANODIZE		
R, RECEPTACLE, WITHOUT MTG. HOLES, COLOR, 18 POSITIONS #582-378-9	J3	
DUO-TYNE LEAF, #66149-4		
EPHONE, C13 DB	J1	
ER, SHOULDER, EXTRUDED, #6529		
ACH, FILLISTER HD, SS, #4-40 X 1/4 LG		
SPLIT LOCK, #4, 3/16 O.D., SS		
MACHINE, SS, #4-40NC-2		
CHINE, SKT., BH, STEEL, X 1/4 LG., BLACK ANODIZE		
CHINE, BH, SS, #4-40NC-2 X 1/4 LG.		
ON HOLE PLUG, #41C		
TERY, #581A	P2	
TYPE "B", 22.5V, #XX15	BT1	
STIC, BLACK, #1750		
NTER, PLASTIC, BLACK, NSERT, #1400		
2T, 100-0-100 uA, #20044003-010 TUDS, W/METER FACE (TP-10478000)	M1	
USHBUTTON, NORMALLY CLOSED, #962	S6	
USHBUTTON, LIGHTED, (NEON) (CLEAR) #40-1	S5	
EVER	S4	ARC
IDE, DPDT, TYPE 126, (SWIDGET)	S3	
SEMBLY	S2	ARC
SEMBLY	S1	ARC
ONT PANEL (TP-21374000)		ARC
UT PLATE (FOR MODEL VARIATION ONLY)		ARC
TE (FOR MODEL VARIATION ONLY)		ARC
(TP-21521425)		ARC
IRCUIT BOARD ASSEMBLY, BOARD "B"		ARC
IRCUIT BOARD ASSEMBLY, BOARD "A"		ARC
COVER ASSEMBLY		
ONT		ARC



DMS-3-9 & -1 OPTION

NOTES:

1. DO NOT USE WASHERS ON METER TERMINALS.
2. INDICATES LAMP CONTACTS ON S5.
3. WHEN C202 IS SUPPLIED WITH BARE METAL CASE, USE ITEM 50.
4. PRESS TABS OF ITEM 21 FLAT AS ILLUSTRATED.

LIST OF MATERIALS OR PARTS LIST

BY	DATE
Van T Mone	8-4-65
E.S Duke	8/6/65
A. Wellan	11-2-65

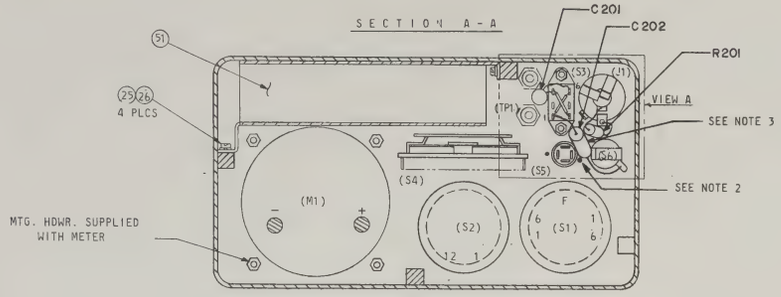
ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DIVISION
ALEXANDRIA, VIRGINIA

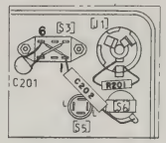
DISTORTION MEASURING SET

DMS-3 -SERIES
(EXCLUDING DMS-3 -13)

OR ATLANTIC RESEARCH
DATE 19
DATE 19

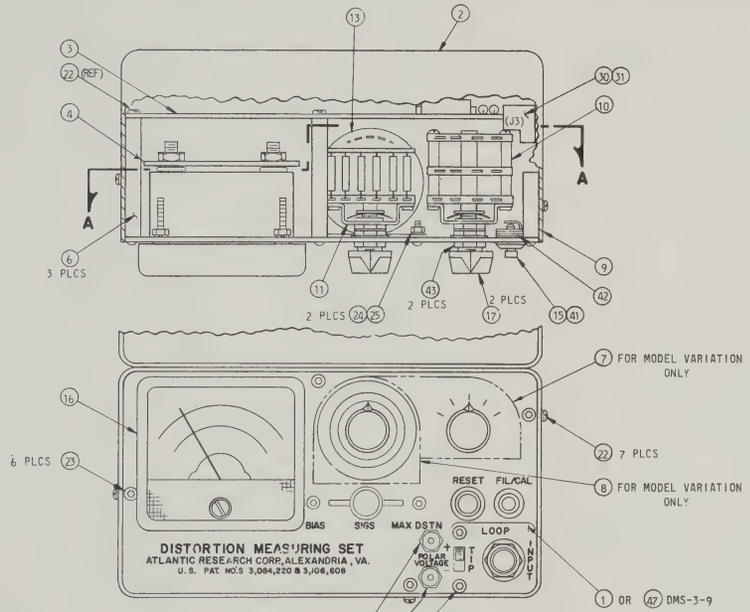
CODE IDENT NO.	SIZE		REV
95335	D	TP-FA-41081501	J LTR
SCALE: 1/1		SHEET 1 OF 2	

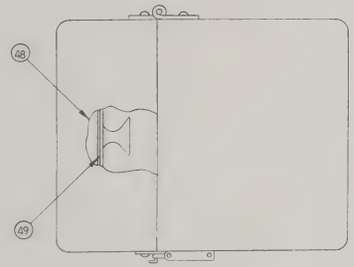




REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHK	APPD
A	ADDED -9 COLUMN PER DCN #377.	12-22-65	FPF	GSB	
B	ADDED VIEW A, DELETED ITEM 33 & 34 FROM 3C-9. DCN #407	5/5/66	FPF	GSB	
C	B-4, ADDED -1 OPTION. DCN #417	6.9.66	I		LW
D	ITEM 5 WAS TERMINAL, EDGE TYPE, BRASS #42587-2 ITEM 38 WAS TUBING, INSULATION, HEAT SHRINKABLE, GREEN, SIZE 3/16. REVISED PER DCN #460. AFFECTS ALL UNITS FROM RUN #3449 ON.	1-6-67	JJ		
E	ITEM 47 WAS DWG. NO. TP-DA-40779425 (SHTS 1 & 4). DCN #521.	8/15/67	E.V.		
F	ITEM 16 WAS METER, TYPE 227PL PER DCN #582. AFFECTS UNITS FROM S/N C1061 ON.	6/1969	EDV		
G	REMOVED SLOTS FROM BATTERY BRACKET. ADDED NOTE 3 AND ITEM 50.	8/7/69	JBW		
H	LETTER C DELETED FROM DMS-3C SERIES DESIGNATION. DCN #787.	11/14/69	EDV		
I	ADDED NOTE 4, ITEM 51. & ITEM 26. QTY OF ITEM 25 WAS 2. EN #899	2/20/70			
J	DELETED ITEM 27 & 46. ITEM 42 QTY. WAS 3. EN 1075A	9-14-70	PES		

COMPONENT DESIGNATION			
REF. DESIG	ITEM	FROM	TO
R201	35	J1, PIN 1	J1, PIN 2
C202	36	S6	S3, PIN 1
C201	37	S3, PIN 6	S3, PIN 3
STRAP	44 & 45	S3, PIN 6	S3, PIN 1
STRAP	44 & 45	S3, PIN 3	S3, PIN 4





NOTES:

1. DO NOT USE WASHERS ON METER TERMINALS.
2. INDICATES LAMP CONTACTS ON S5.
3. WHEN C202 IS SUPPLIED WITH BARE METAL CASE, USE ITEM 50.
4. PRESS TABS OF ITEM 21 FLAT AS ILLUSTRATED.

(CONTINUED ON SHEET 2 OF 2)

-9 QTY	3-SER QTY	PART OR IDENTIFYING NO.	ITEM NO.	DESCRIPTION	REF DESIG	MANUFACTURER
2	2		32	SCREW, MACHINE, SKT, BUTTON HD, STEEL, #3-48NC-2 X 1/4 LG., BLACK ANODIZE		
1	1	33316	31	CONNECTOR, RECEPTACLE, WITHOUT MTG. HOLES, NATURAL COLOR, 18 POSITIONS #582-378-9	J3	
17	17	33338	30	CONTACT, DUO-TYNE LEAF, #66149-4		
1	1	33160	29	JACK, TELEPHONE, C13 DB	J1	
2	2		28	FIBREWASHER, SHOULDER, EXTRUDED, #6529		
			27			
4	4		26	SCREW, MACH, FILLISTER HD, SS, #4-40 X 1/4 LG		
6	6		25	WASHER, SPLIT LOCK, #4, 3/16 O.D., SS		
2	2		24	NUT, HEX, MACHINE, SS, #4-40NC-2		
6	6		23	SCREW, MACHINE, SKT., BH, STEEL, #4-40NC-2 X 1/4 LG., BLACK ANODIZE		
7	7		22	SCREW, MACHINE, BH, SS, #4-40NC-2 X 1/4 LG.		
1	1	33701	21	SNAP BUTTON HOLE PLUG, #41C		
1	1	33407	20	PLUG, BATTERY, #5814	P2	
1	1	33250	19	BATTERY, TYPE "B", 22.5V, #XX15	BT1	
1	1	33115	18	KNOB, PLASTIC, BLACK, #1750		
2	2	33112	17	KNOB, POINTER, PLASTIC, BLACK, W/PRESS INSERT, #1400		
1	1	33033	16	METER, #72T, 100-0-100 uA, #20044003-010 W/.290 STUDS, W/METER FACE (TP-10478000)	M1	
1	1	33556	15	SWITCH, PUSHBUTTON, NORMALLY CLOSED, #962	S6	
1	1	33553	14	SWITCH, PUSHBUTTON, LIGHTED, (NEON) (CLEAR) #40-1	S5	
1	1	TP-21426000	13	SWITCH, LEVER	S4	ARC
1	1	33578	12	SWITCH, SLIDE, DPDT, TYPE 126, (SWIDGET)	S3	
1	1	TP-AD-40808425	11	SWITCH ASSEMBLY	S2	ARC
1	1	TP-AD-31146501	10	SWITCH ASSEMBLY	S1	ARC
1	1	33759	9	MOUNT, FRONT PANEL (TP-21374000)		ARC
-	1	TP-31147501	8	SPEED INPUT PLATE (FOR MODEL VARIATION ONLY)		ARC
-	1	TP-41088501	7	SPEED PLATE (FOR MODEL VARIATION ONLY)		ARC
3	3	33760	6	STANDOFF (TP-21521425)		ARC
			5			
1	1	TP-AD-41086501	4	PRINTED CIRCUIT BOARD ASSEMBLY, BOARD "B"		ARC
1	1	TP-AD-41084501	3	PRINTED CIRCUIT BOARD ASSEMBLY, BOARD "A"		ARC
1	1	TP-SA-40796425	2	CASE AND COVER ASSEMBLY		
-	1	TP- 41080501	1	PANEL, FRONT		ARC

LIST OF MATERIALS OR PARTS LIST

DASH NO.	NEXT ASSEMBLY	PROJECT
APPLICATION		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES:
ANGLES ± ~
FRACTIONS ± ~
2 PLACE DECIMALS ± ~
3 PLACE DECIMALS ± ~
SURFACE ROUGHNESS √

DO NOT SCALE DRAWING

MATERIAL: ~

APPROVAL	BY	DATE
DRAWN	W.T. Ames	8-4-65
CHECKED	E.S. Blake	8/6/65
ENGRG		
PROJ ENGRG	L. Wallace	11-1-65
STRESS		

APPROVED FOR ATLANTIC RESEARCH NAME DATE 19
APPROVED NAME DATE 19

ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DIVISION
ALEXANDRIA, VIRGINIA

DISTORTION MEASURING SET

DMS-3 -SERIES
(EXCLUDING DMS-3 -13)

CODE IDENT NO.	SIZE		REV
95335	D	LTP-FA-4108150	J LTR
SCALE 1/1		SHEET 1 OF 2	

REVISIONS				
SYM	DESCRIPTION	DATE	BY	CHK	APPD

DESCRIPTION	REF DESIG	MANUFACTURER
BATTERY		ARC
SHRINK, #CRN2, 3/16 X 1-1/16		RAYCLAD TUBES, INC.
ETAINER, TEST CABLE		ARC
ST ASSEMBLY		ARC
RONT		ARC
ON, TUBING, TEFLON, NO. 20		
PPER, SOLID, TINNED, #22 AWG		
, 3/8-32NFD, BRASS N/P #P-1000-1		
ER, INTERNAL TOOTH, SS, 1/4		
VE NUT, 1/4-32NEF, BRASS N/P. #30C1023		
, MACHINE, SS, #3-48NC-2		
SPLIT LOCK, #3, SS		
R, FIXED, CERAMIC DISC; .1 MFD, #33C41 (TG-PIC)	C201	
R, SOLID, TANTALUM, 11 MFD, NON POLAR; K11N10	C202	
, FIXED, WW, 7, 3W, ±1%, TYPE RS-2B	R201	
ST, BLACK, # 242-127-0	TP2	ELEC. MOULDING CORP.
ST, RED, #424, 127-2	TP1	ELEC. MOULDING CORP.

LIST OF MATERIALS OR PARTS LIST

BY	DATE
wtm	8-6-65
E.S.Dake	8/6/65
L.Wallace	8/6/65

OR ATLANTIC RESEARCH

DATE 19

DATE 19

ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DIVISION
ALEXANDRIA, VIRGINIA

DISTORTION MEASURING SET

DMS-3 -SERIES
(EXCLUDING DMS-3 -13)

CODE IDENT NO.	SIZE		RFV
95335	D	TP-FA-4108150 1	J LTR
SCALE: 1/1		SHEET 2 OF 2	

REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHK	APPD

QTY	QTY	PART OR IDENTIFYING NO.	ITEM NO.	DESCRIPTION	REF DESIG	MANUFACTURER
1	1	TP-31389696	51	BRACKET, BATTERY		ARC
AR	AR		50	TUBING, SHRINK, #CRN2, 3/16 X 1-1/16		RAYCLAD TUBES, INC.
1	-	TP-DA-31144425	49	PLATE, RETAINER, TEST CABLE		ARC
1	-	TP-AD-31143425	48	CABLE TEST ASSEMBLY		ARC
1	-	TP- 41080501	47	PANEL, FRONT		ARC
			46			
AR	AR		45	INSULATION, TUBING, TEFLON, NO. 20		
AR	AR		44	WIRE, COPPER, SOLID, TINNED, #22 AWG		
2	2	33786	43	NUT, HEX, 3/8-32NFD, BRASS N/P #P-1080-1		
1	1		42	LOCKWASHER, INTERNAL TOOTH, SS, 1/4		
1	1	33723	41	DECORATIVE NUT, 1/4-32NEF, BRASS N/P #30C1023		
2	2		40	NUT, HEX, MACHINE, SS, #3-48NC-2		
2	2		39	WASHER, SPLIT LOCK, #3, SS		
			38			
1	1	32160	37	CAPACITOR, FIXED, CERAMIC DISC; .1 MFD, 50 WVDC, #33C41 (TG-PIC)	C201	
1	1	32100	36	CAPACITOR, SOLID, TANTALUM, 11 MFD, 10 WVDC, NON POLAR; KIINIO	C202	
1	1	31033	35	RESISTOR, FIXED, WW, [illegible] 2.3W, ±1%, TYPE RS-2B	R201	
-	1		34	JACK, TEST, BLACK, #42-127-0	TP2	ELEC. MOULDING CORP.
-	1		33	JACK, TEST, RED, #42[illegible] 127-2	TP1	ELEC. MOULDING CORP.

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES:
ANGLES ± ——
FRACTIONS ± ——
2 PLACE DECIMALS ± ——
3 PLACE DECIMALS ± ——
SURFACE ROUGHNESS √
DO NOT SCALE DRAWING
MATERIAL:

APPROVAL	BY	DATE
DRAWN	[illegible]	8-6-65
CHECKED	E.S. Duke	8/6/65
ENGRG		
PROJ ENGRG	R. Hallock	8/6/65
STRESS		

APPROVED FOR ATLANTIC RESEARCH
NAME DATE 19
APPROVED
NAME DATE 19

ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DIVISION
ALEXANDRIA, VIRGINIA

DISTORTION MEASURING SET

DMS-3 -SERIES
(EXCLUDING DMS-3 -13)

CODE IDENT NO.	SIZE		REV
95335	D	TP-FA-41081501	J LTR
SCALE: 1/1		SHEET 2 OF 2	

DASH NO.	NEXT ASSEMBLY	PROJECT
APPLICATION		

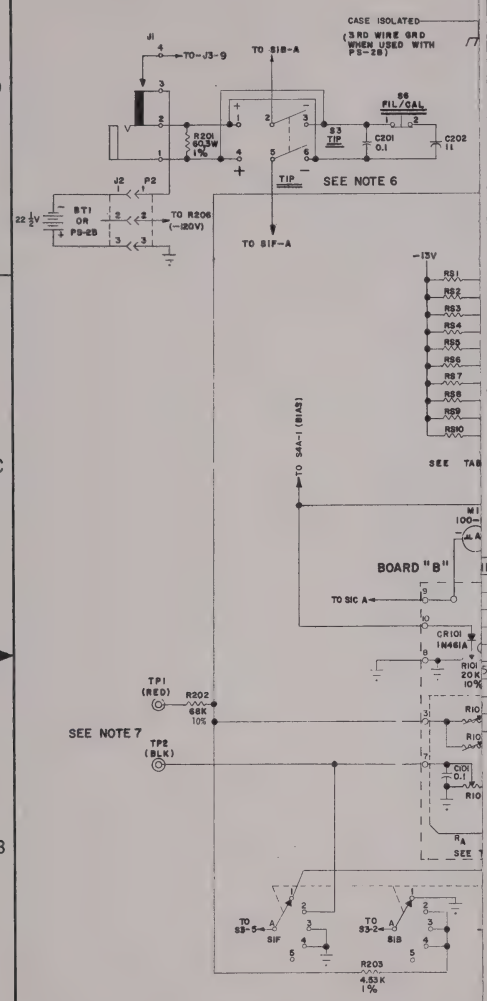


TABLE 3

INPUT TABULATION

	RA(POT)	RB (1%)
	500	15K(5%)
	50K	49.9K
	20K	38.3K
	10K	27.4K
	10K	24.9K
	10K	19.1K
	5K	14.7K

MODEL	SPEED : BAUD										
	20	37.5	45.5	50.0	56.9	61.1	66.7	74.2	75.0	110	135
DMS-3-1		RS1	RS2		RS3	RS4		RS5		RS6	
DMS-3-2		RS1	RS2		RS3	RS4		RS5		RS6	
DMS-3-3		RS1	RS2	RS3	RS4	RS5	RS6	RS7		RS8	RS9
DMS-3-4		RS1	RS2	RS3	RS4	RS5		RS6		RS7	
DMS-3-5		RS1	RS2	RS3	RS4	RS5			RS5		
DMS-3-6	RS1	RS2	RS3	RS4	RS5	RS6		RS7		RS8	
DMS-3-7		RS1	RS2	RS3	RS4	RS5		RS6		RS8	
DMS-3-8		RS1	RS2	RS3	RS4	RS5		RS6		RS7	
DMS-3-9			RS1		RS2 RS3 *			RS4		RS5	
DMS-3-10		RS1	RS2	RS3	RS4	RS5	RS6	RS7		RS8	RS9
DMS-3-11		RS1	RS2	RS3	RS4	RS5	•	RS6		RS7	
DMS-3-12		RS1	RS2	RS3	RS4	RS5		RS6	RS7	RS8	
DMS-3-14			RS1	RS2					RS3		
DMS-3-15			RS2	RS3	RS4	RS5	RS6	RS7		RS8	RS9

* POSITIONS 2 AND 3 STRAPPED ON S2.

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A. ALL RESISTANCE VALUES ARE IN OHMS, 1/2, ±5%.
   B. ALL CAPACITANCE VALUES ARE IN MICROFARADS.
2. Q9 & Q12 ARE A MATCHED PAIR PER DWG. TP-SD-21403425.
3. INPUT SIGNAL MARKING W/POS TIP.
4. S1 SHOWN AS DMS-3-10; FOR OTHER MODELS SEE TABLE 1.
5. SIGNAL LIGHT FUNCTIONS ONLY WHEN PS-28 IS USED.
6. IN MODEL DMS-3-9, S3 NOMENCLATURE IS LOOP; NORMAL AND REV. REPLACE - AND + RESPECTIVELY.
7. FOR DMS-3-9 OMIT TP1, TP2 AND R202.
8. R204 TO BE SELECTED AT CALIBRATION.

REVISIONS

SYM	DESCRIPTION	DATE	BY	CHK	APPD
A	ADDED SEE NOTE 6&7, INFO FOR DMS-3C-9 TO TABLE I. DCN #377	12/22/65	FPF	EGO	
B	CHANGED CONNECTION ON J1-4, FROM J3-10 TO TO J3-9, CONNECTED J3-4 TO S4C-1, ALSO ADDED NOTE 8. DCN #385	2-15-66	FG	EGO	
C	Q14 & Q15 WERE 2N404, R4 WAS 39K, R3 & R9 WERE 4.7K; R7 WAS 22K. DCN 411. ALL UNITS EFFECTED. THOSE IN FIELD WILL BE MODIFIED AT CUSTOMERS REQUEST.	5-17-66	JGJ		
D	R3 WAS 10K, R14 & R15 WERE 4.7K, Q4 & Q6 WERE 2N404. DELETED CR7. DCN #411 EFFECTS ALL UNITS.	6/27/66	JPF	EGO	
E	ADDED R44 TO BOARD "A". DCN# 419 EFFECTS ALL UNITS.	8-17-66	SI		
F	Q14, Q15 WERE 2N3638 & ADDED DMS-3C-14 TO TABULATION. DCN #442	11-29-66			
G	DELETED J4 & P4 REF BOARD "B". DCN #460 EFFECTS ALL UNITS FROM RUN 3449 ON.	1-6-67	JJ		
H	TABLE 2, 150 BAUD RESISTOR VALUE WAS 43.2K. DCN #479	5 MAY 67	RJR		
J	ADDED DMS-3C-15 MODEL. DCN #584	11-3-67			
K	DELETED R42. CR18 WAS 1N717A. DCN #591	1-23-68			
L	LETTER C REMOVED FROM DMS-3C DESIGNATION. DCN #787	11/13/69			
M	ADDED 10% TO R202. EN #1017	5-1-70	PES		
N	ADDED VALUE 69.8K & 34K TO TABLE 2. EN #1124A	9-15-70	PES		

DESCRIPTION	REF DESIG	MANUFACTURER

LIST OF MATERIALS OR PARTS LIST

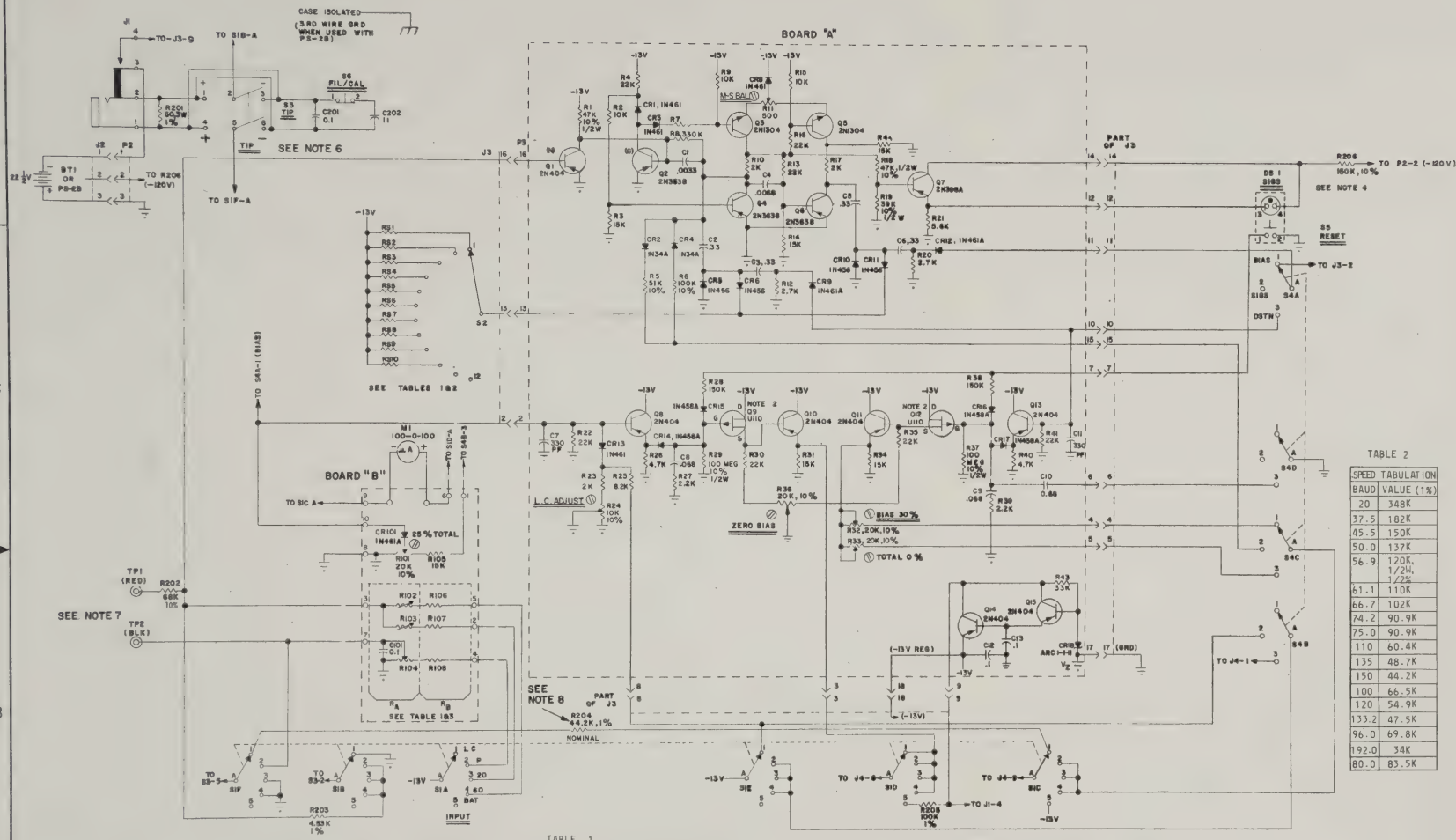
BY	DATE
F FOSTER	8-5-65
	11-2-65
	11-2-65

ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DIVISION
ALEXANDRIA, VIRGINIA

SCHEMATIC DIAGRAM

DISTORTION MEASURING SET
DMS-3 -SERIES (EXCLUDING DMS-3 -13)
U. S. PAT. NOS. 3,084,220 & 3,106,608

FOR ATLANTIC RESEARCH	CODE IDENT NO.	SIZE		REV
DATE 19	95335	D	TP-SD-4108250	N LTR
DATE 19	SCALE		SHEET	



REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHK	APPD
A	ADDED SEE NOTE 6&7, INFO FOR DMS-3C-9 TO TABLE I. DCN #377	11-23-65	FDF		
B	CHANGED CONNECTION ON J1-4, FROM J3-10 TO TO J3-9, CONNECTED J3-4 TO S4C-1, ALSO ADDED NOTE 8. DCN #385	2-15-66	FDF		
C	Q14 & Q15 WERE 2N404, R4 WAS 39K, R3 & R9 WERE 4.7K; R7 WAS 22K. DCN 411. ALL UNITS EFFECTED. THOSE IN FIELD WILL BE MODIFIED AT CUSTOMERS REQUEST.	5-17-66	JGJ		
D	R3 WAS 10K, R14 & R15 WERE 4.7K, Q4 & Q6 WERE 2N404. DELETED CR7. DCN #411 EFFECTS ALL UNITS.	6/27/66	JPT		
E	ADDED R44 TO BOARD "A". DCN #419 EFFECTS ALL UNITS.	8-17-66	SI		
F	Q14, Q15 WERE 2N3638 & ADDED DMS-3C-14 TO TABULATION. DCN #442	11-29-66			
G	DELETED J4 & P4 REF BOARD "B". DCN #460 EFFECTS ALL UNITS FROM RUN 3449 ON.	1-6-67	JJ		
H	TABLE 2, 150 BAUD RESISTOR VALUE WAS 43.2K. DCN #479	5 MAY 67	RJR		
J	ADDED DMS-3C-15 MODEL. DCN #584	11-3-67	EPL		
K	DELETED R42. CR18 WAS 1N717A. DCN #591	1-23-68	JC		
L	LETTER C REMOVED FROM DMS-3C DESIGNATION. DCN #787	11/13/69	EPL		
M	ADDED 10% TO R202. EN #1017	5-1-70	PES		
N	ADDED VALUE 69.8K & 34K TO TABLE 2. EN #1124A	9-15-70	PES		

TABLE 2

SPEED TABULATION	
BAUD	VALUE (1%)
20	348K
37.5	182K
45.5	150K
50.0	137K
56.9	120K, 1/2W, 1/2%
61.1	110K
66.7	102K
74.2	90.9K
75.0	90.9K
110	60.4K
135	48.7K
150	44.2K
100	66.5K
120	54.9K
133.2	47.5K
96.0	69.8K
192.0	34K
80.0	83.5K

TABLE 3

INPUT TABULATION		
MA	RA(POT)	RB (1%)
P	500	15K(5%)
20	50K	49.9K
40	20K	38.3K
60	10K	27.4K
62.5	10K	24.9K
70	10K	19.1K
110	5K	14.7K

TABLE 1

MODEL VARIATIONS

MODEL	SPEED : BAUD																	INPUT: MA																	
	20	37.5	45.5	50.0	56.9	61.1	66.7	74.2	75.0	110	135	150	100	120	133.2	96.0	192.0	80.0	P		20		40		60		62.5		70		110		5	
																			RA	RB	RA	RB	RA	RB	RA	RB	RA	RB	RA	RB	RA	RB	RA	RB
DMS-3-1		RS1	RS2		RS3	RS4		RS5		RS6									R104	R108	R103	R107					R102	R106								
DMS-3-2		RS1	RS2		RS3	RS4		RS5		RS6									R104	R108	R103	R107							R102	R106						
DMS-3-3		RS1	RS2	RS3	RS4	RS5	RS6	RS7		RS8	RS9	RS10							R104	R108									R103	R107	R102	R106				
DMS-3-4		RS1	RS2	RS3	RS4	RS5		RS6		RS7									R104	R108	R103	R107					R102	R106								
DMS-3-5		RS1	RS2	RS3	RS4	RS5			RS5										R104	R108	R103	R107			R102	R106										
DMS-3-6	RS1	RS2	RS3	RS4	RS5	RS6		RS7		RS8									R104	R108	R103	R107					R102	R106								
DMS-3-7		RS1	RS2	RS3	RS4	RS5		RS6		RS8			RS7	RS9					R104	R108	R103	R107					R102	R106								
DMS-3-8		RS1	RS2	RS3	RS4	RS5		RS6		RS7		RS8							R104	R108	R103	R107					R102	R106								
DMS-3-9			RS1		RS2 RS3 *			RS4		RS5									R104	R108	R103	R107					R102	R106								
DMS-3-10		RS1	RS2	RS3	RS4	RS5	RS6	RS7		RS8	RS9	RS10							R104	R108	R103	R107					R102	R106								
DMS-3-11		RS1	RS2	RS3	RS4	RS5	*	RS6		RS7					RS8				R104	R108	R103	R107					R102	R106								
DMS-3-12		RS1	RS2	RS3	RS4	RS5		RS6	RS7	RS8									R104	R108	R103	R107					R102	R106								
DMS-3-14			RS1	RS2					RS3						RS4	RS5			R104	R108	R103	R107					R102	R106								
DMS-3-15			RS2	RS3	RS4	RS5	RS6	RS7		RS8	RS9	RS10					RS1		R104	R108	R103	R107					R102	R106								

* POSITIONS 2 AND 3 STRAPPED ON S2.

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A. ALL RESISTANCE VALUES ARE IN OHMS, 1/2, ±5%.
   B. ALL CAPACITANCE VALUES ARE IN MICROFARADS.
2. Q9 & Q12 ARE A MATCHED PAIR PER DWG. TP-SD-21403425.
3. INPUT SIGNAL MARKING W/POS TIP.
4. S1 SHOWN AS DMS-3-10; FOR OTHER MODELS SEE TABLE 1.
5. SIGNAL LIGHT FUNCTIONS ONLY WHEN PS-28 IS USED.
6. IN MODEL DMS-3-9, S3 NOMENCLATURE IS LOOP; NORMAL AND REV. REPLACE - AND + RESPECTIVELY.
7. FOR DMS-3-9 OMIT TP1, TP2 AND R202.
8. R204 TO BE SELECTED AT CALIBRATION.

QTY REQD	PART OR IDENTIFYING NO.	ITEM NO.	DESCRIPTION	REF DESIG	MANUFACTURER

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES:
ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
SURFACE ROUGHNESS √
DO NOT SCALE DRAWING
MATERIAL:

	BY	DATE
APPROVAL		
DRAWN	F FOSTER	8-5-65
CHECKED		11-2-65
ENGRG		
PROJ ENGRG		11-2-65
STRESS		

APPROVED FOR ATLANTIC RESEARCH NAME DATE 19
APPROVED NAME DATE 19

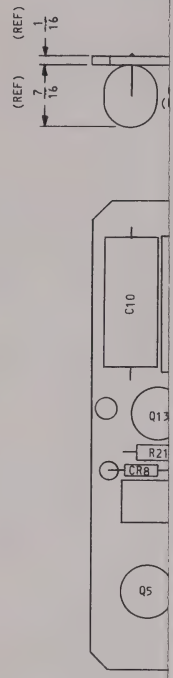
ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DIVISION
ALEXANDRIA, VIRGINIA

SCHEMATIC DIAGRAM
DISTORTION MEASURING SET
DMS-3 -SERIES (EXCLUDING DMS-3 -13)
U.S. PAT. NOS. 3,084,220 & 3,106,608

DASH NO.	NEXT ASSEMBLY	PROJECT
	APPLICATION	

CODE IDENT NO.	SIZE		REV
95335	D	TP-SD-41082501	N LTR
SCALE		SHEET	

REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHK	APPD
F	REDRAWN AND PARTS LIST DELETED PER DCN 582.	6/10/69	EJV	WAT	AR
G	LETTER C DELETED FROM DMS-3C DESIGNATION. DCN 787	11/19/69	G.S.	[illegible]	AR



NOTES:

1. CIRCLE ◯ INDICATES CATHOD
2. DMS-3 -13 ONLY:
   A. COAT FRONT AND REAR EXCEPT CONNECTOR AN TUFFILM SPRAY.
   B. C2 AND C3; C5 AND C MATCHED TO ±3%.

DESCRIPTION	REF DESIG	MANUFACTURER

LIST OF MATERIALS OR PARTS LIST

	BY	DATE
E	EJVinson	6/10/69
F	[illegible]	7/7/69
G	[illegible]	7-1-69

ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DEPT.
A DIVISION OF THE SUSQUEHANNA CORP.
ALEXANDRIA, VIRGINIA – 22314

PRINTED CIRCUIT BD "A" ASS'Y
DISTORTION MEASURING SET
DMS-3 SERIES

FOR ATLANTIC RESEARCH

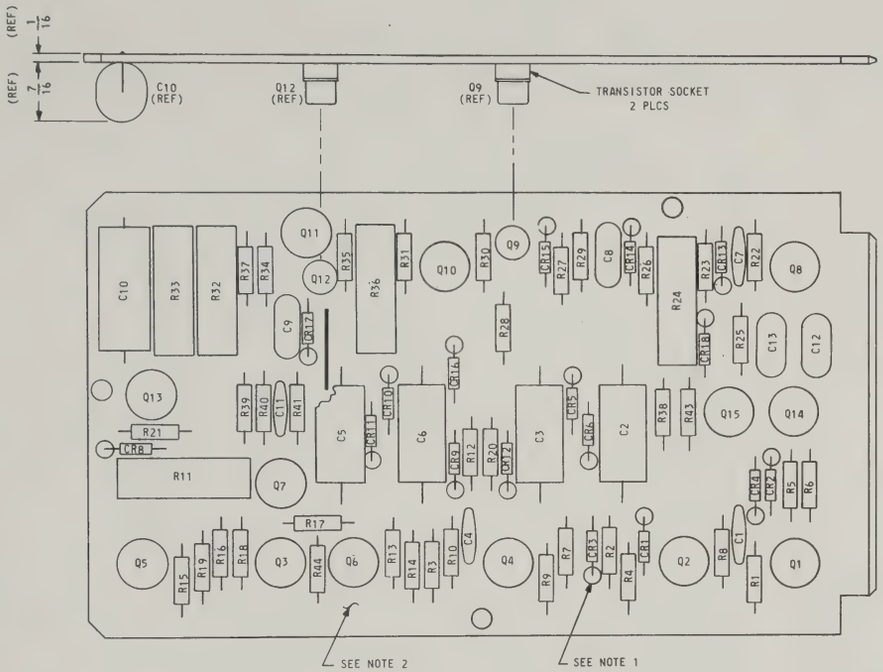
E _____ DATE 19__

F _____ DATE 19__

CODE IDENT NO.	SIZE		REV
95335	D	TP-AD-4108450	G LTR

SCALE: 2/1 SHEET 1 OF

REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHK	APPD
F	REDRAWN AND PARTS LIST DELETED PER DCN 582	6/10/69	EP	[illegible]	[illegible]
G	LETTER C DELETED FROM DMS-3C DESIGNATION. DCN 787	11/13/69	GS	[illegible]	[illegible]



NOTES:

1. CIRCLE ◯ INDICATES CATHODE END OF DIODE.
2. DMS-3 -13 ONLY:
   - A. COAT FRONT AND REAR OF P.C. BOARD, EXCEPT CONNECTOR AND POT SCREWS WITH TUFFILM SPRAY.
   - B. C2 AND C3; C5 AND C6 ARE AMPEREX, MATCHED TO ±3%.

QTY REQD	PART OR IDENTIFYING NO.	ITEM NO.	DESCRIPTION	REF DESIG	MANUFACTURER

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES:
ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
SURFACE ROUGHNESS √

DO NOT SCALE DRAWING

MATERIAL:

	APPROVAL	BY	DATE
DRAWN		EP Vinson	6/10/69
CHECKED		[illegible]	7/7/69
ENGRG			
PROJ ENGRG		[illegible]	7/7/69
STRESS			

APPROVED FOR ATLANTIC RESEARCH _____ 19
NAME DATE
APPROVED _____ 19
NAME DATE

ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DEPT.
A DIVISION OF THE SUSQUEHANNA CORP.
ALEXANDRIA, VIRGINIA – 22314

PRINTED CIRCUIT BD "A" ASS'Y
DISTORTION MEASURING SET
DMS-3 SERIES

CODE IDENT NO.	SIZE		REV
95335	D	TP-AD-41084501	G LTR

SCALE 2/1 SHEET 1 OF

DASH NO.	NEXT ASSEMBLY	PROJECT
-	TP-FA-41123503	DMS-3 -13
-	TP-FA-41081501	DMS-3 -SER

APPLICATION

4 1

REVISIONS					
	DESCRIPTION	DATE	BY	CHK	APP.
	REDRAWN. IMAGE CHANGED DUE TO ARTWORK REVISION. NO ASSEMBLY CHANGES EFFECTED. PER DCN #460. AFFECTS ALL UNITS FROM RUN NO. 3449 UP.	1-10-67			
	ADDED DMS-3C-15 TABULATION TO TABLE AND L/M PER DCN 584.	11-17-67			
	R101 THRU R104 WERE BOURNS, WIRE WOUND, 3067P STYLE PER DCN 582. AFFECTS UNITS S/N C1061 ON.	6/10/69			
	LETTER C DELETED FROM DMS-3C DESIGNATION. DCN 787	11/19/69			
	ADDED NOTE 2 EN#899	2/10/70			
	MOVED METER PADS 1/8 EN#989	5-1-70	PES		

D D

(7)
(6)
(5)
(4)
(3)
(2)
(1)

R,CERMET,20K,.75W,±10%,79PR20K	R103
3.3K,1/2W,±1%	SEE TAB BLOCK
7.4K, 1/2W, ±1%	
24.9K, 1/2W, ±1%	
R,CERMET ,50K,.75W,±10%, 79PR50K	
49.9K, 1/2W, ±1%	
14.7K, 1/2W, ±1%	
R,CERMET, 5K, .75W, ±10%, 79PR5K	
19.1K, 1/2W, ±1%	
R,CERMET,10K,.75W,±10%,79PR10K	
15K, 1/2W, ±5%	
R,CERMET,5000,.75W,±10%, 79PR500	SEE TAB BLOCK
15K, 1/2W, ±5%	R105
R,CERMET,20K,.75W,±10%, 79PR20K	R101
0.1MFD,250WVDC,±20%,C280AE/P100K	C101
CON,ARC SPEC 1-1-2	CR101
RCUIT BOARD "B"	ATLANTIC RESEARCH
	REF DESIG
MATERIALS OR PARTS LIST	

ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DIVISION
ALEXANDRIA, VIRGINIA

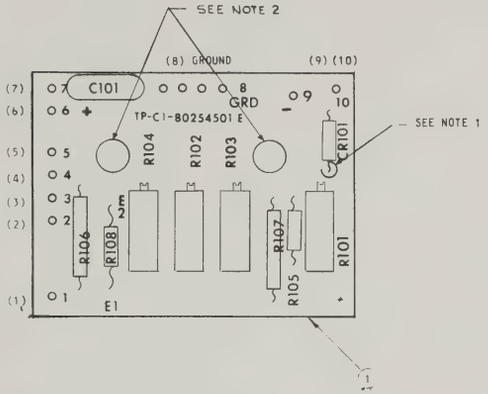
PRINTED CIRCUIT BD "B" ASSY

DISTORTION MEASURING SET
DMS-3 SERIES (EXCLUDING DMS-3 -13)

ATLANTIC RESEARCH	CODE IDENT NO	SIZE		REV
19	95335	D	TP-AD-4108650I	H
19	SCALE 2/1		SHEET	

1

REVISIONS					
LTR	DESCRIPTION	DATE	BY	CHK	APP
C	REDRAWN. IMAGE CHANGED DUE TO ARTWORK REVISION. NO ASSEMBLY CHANGES EFFECTED. PER DCN #460. AFFECTS ALL UNITS FROM RUN NO. 3449 UP.	1-10-67	BJ		
D	ADDED DMS-3C-15 TABULATION TO TABLE AND L/M PER DCN 584.	11-17-67	EW		
E	R101 THRU R104 WERE BOURNS, WIRE WOUND, 3067P STYLE PER DCN 582. AFFECTS UNITS S/N C1061 ON.	6/16/69	EW		
F	LETTER C DELETED FROM DMS-3C DESIGNATION. DCN 787	11/19/69	GS		
G	ADDED NOTE 2 EN #899	2/11/70	JF		
H	MOVED METER PADS 1/8 EN #989	5-1-70	PES		



NOTE:
1. CIRCLE ○ INDICATES CATHODE END OF DIODE.
2. TIN PAD AREA AROUND METER TERMINAL STUD MOUNTING AND REMOVE FLUX.

TABULATION TABLE							
MODEL	REQ'D DASH NO.	R102	R103	R104	R106	R107	R108
DMS-3 -1	-1	10K	50K	500	24.9K	49.9K	15K
DMS-3 -2	-2	10K	50K	500	19.1K	49.9K	15K
DMS-3 -3	-3	5K	10K	500	14.7K	19.1K	15K
DMS-3 -4	-4	10K	50K	500	24.9K	49.9K	15K
DMS-3 -5	-5	10K	50K	500	27.4K	49.9K	15K
DMS-3 -6	-6	10K	50K	500	24.9K	49.9K	15K
DMS-3 -7	-7	10K	50K	500	24.9K	49.9K	15K
DMS-3 -8	-8	10K	50K	500	24.9K	49.9K	15K
DMS-3 -9	-9	10K	50K	500	24.9K	49.9K	15K
DMS-3 -10	-10	10K	50K	500	24.9K	49.9K	15K
DMS-3 -11	-11	10K	50K	500	24.9K	49.9K	15K
DMS-3 -12	-12	10K	50K	500	24.9K	49.9K	15K
DMS-3 -14	-14	10K	20K	500	24.9K	38.3K	15K
DMS-3 -15	-15	10K	50K	500	24.9K	49.9K	15K

-15	-14	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	QTY REQ	PART OR IDENTIFYING NO		
-	1	-	-	-	-	-	-	-	-	-	-	-	-		32796	17	RESISTOR,VAR,CERMET,20K,.75W,±10%,.79PR20K
-	1	-	-	-	-	-	-	-	-	-	-	-	-		30384	16	RESISTOR,38.3K,1/2W,±1%
-	-	-	-	-	-	-	-	1	-	-	-	-	1		30366	15	RESISTOR,27.4K, 1/2W, ±1%
1	1	1	1	1	1	1	1	-	1	-	-	-	1		30361	14	RESISTOR, 24.9K, 1/2W, ±1%
1	-	1	1	1	1	1	1	1	-	1	-	1	1		32789	13	RESISTOR,VAR,CERMET ,50K,.75W,±10%,.79PR50K
1	-	1	1	1	1	1	1	1	-	1	-	1	1		30397	12	RESISTOR, 49.9K, 1/2W, ±1%
-	-	-	-	-	-	-	-	-	-	1	-	1	-		30337	11	RESISTOR, 14.7K, 1/2W, ±1%
-	-	-	-	-	-	-	-	-	-	1	1	-	-		32791	10	RESISTOR,VAR.,CERMET,5K, .75W, ±10%,.79PR5K
-	-	-	-	-	-	-	-	-	-	1	1	-	-		30349	9	RESISTOR, 19.1K, 1/2W, ±1%
1	1	1	1	1	1	1	1	1	1	1	1	-	-		32798	8	RESISTOR,VAR.,CERMET,10K, .75W,±10%,.79PR10K
1	1	1	1	1	1	1	1	1	1	1	1	1	1		30657	7	RESISTOR, 25K, 1/2W, ±5%
1	1	1	1	1	1	1	1	1	1	1	1	1	1		32790	6	RESISTOR,VAR.,CERMET,500Ω, .75W,±10%, .79PR500
1	1	1	1	1	1	1	1	1	1	1	1	1	1		30657	5	RESISTOR, 25K, 1/2W, ±5%
1	1	1	1	1	1	1	1	1	1	1	1	1	1		32796	4	RESISTOR,VAR.,CERMET,20K, .75W,±10%, .79PR20K
1	1	1	1	1	1	1	1	1	1	1	1	1	1		32659	3	CAPACITOR,0.1MFD,250WVDC,±20%,C280AE/P100K
1	1	1	1	1	1	1	1	1	1	1	1	1	1		32514	2	DIODE,SILICON,AN,SPEC 1-1-2
1	1	1	1	1	1	1	1	1	1	1	1	1	1		TP-A1085501	1	PRINTED CIRCUIT BOARD "B"

R103 SEE TAB BLOCK
R105 SEE TAB BLOCK
R101
C101
ATLANTIC RESEARCH

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE
ANGLES
FRACTIONS
2 PLACE DECIMALS
3 PLACE DECIMALS
SURFACE ROUGHNESS

DO NOT SCALE DRAWING
MATERIAL

APPROVED

ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DIVISION
ALEXANDRIA, VIRGINIA

PRINTED CIRCUIT BD "B" ASSY

DISTORTION MEASURING SET
DMS-3 SERIES (EXCLUDING DMS-3 -13)

CODE IDENT NO	SIZE	
95335	D	TP-AD-41086501 H

SCALE 2/1 SHEET —

-	TP-FA 41123503	DMS-3 -13
-	TP-FA-41081501	DMS-3 SER
DASH NO	NEXT ASSEMBLY	PROJECT
APPLICATION		

ATLANTIC RESEARCH CORPORATION · 5390 CHEROKEE AVENUE · ALEXANDRIA, VIRGINIA · 22314 · 703-354-3400

WARRANTY

There are no warranties which extend beyond the description, including the limitations on warranties, contained herein.

The Seller warrants these articles are free from defects in material and workmanship. This warranty shall not apply to any equipment which has been (1) altered or repaired by anyone other than Seller, (2) subject to misuse, negligence or accident, (3) operated beyond its design range, improperly tested or mishandled in any way.

All articles are to be properly and carefully inspected promptly upon receipt. If the article does not meet the requirements of the applicable specification, the customer shall in writing notify the Seller within 90 days.

All warranty repairs will normally be made at Seller's plant located in Alexandria, Virginia, except for certain fixed installations. No product may be returned for repair without Seller's prior, written permission.

When written permission is received by Buyer, material requiring repair shall be sent prepaid to the place specified by Seller, accompanied by a report stating as completely as possible the reason for rejection, the defects, and the conditions under which they occurred.

TELEPRODUCT®. TELEPRODUCT equipment carries a warranty for one (1) year from date of delivery and provides for all labor and materials required to repair a defective unit during that period except for meters and batteries, which carry a sixty (60) day warranty period.

For fixed installations, Teleproduct Field Engineering is available to care for service, installation and training associated with Teleproduct equipment. Seller's equipment is subject to warranty. A charge will be made for servicing other manufacturers' equipment working into Teleproduct equipment.

For Customer Service, Call:

Quality Assurance – X674
Marketing – X604

TP-066-9-73

ATLANTIC RESEARCH CORPORATION · 5390 CHEROKEE AVENUE · ALEXANDRIA, VIRGINIA · 22314 · 703-354-3400
TWX 710-832-9828

EQUIPMENT QUALITY REPORT

Dear Customer:

We are trying to manufacture the most reliable products possible. You would do us a great courtesy by completing this form should you experience any problems.

I. Equipment Name_____ Model No._____ Ser. No._____

Customer Firm Name_____ Contact Name_____

Division_____ Title_____

Street Address_____ Telephone( ) _____

City, State_____ Zip_____ Country_____

TWX/TLX_____ Prepared By_____

II. Detailed description of problem, malfunctions (use extra sheets if necessary) and any attempts at correcting problem._____

_____

_____

_____

Approximate Hours/Days of Operation to Failure_____

Failure Occurred During: Receiving Insp.___ Cust. Installation____

Field Use____

Prepared By_____

III. Disposition:

A. Field Repair Successful? ___No ___Yes

B. Unit Returned? ___No ___Yes Repair Order No._____

C. Date Received For Repair_____

Date Shipped to Customer_____

D. Cause of Failure_____

_____

_____

E. Corrective Action:_____

_____

_____

_____

_____ Prepared By_____

If repair service is required, please obtain return authorization prior to returning equipment to ARC. Tel. (703) 354-3400 Ext. 542, or TWX 710-832-9828.

Distribution:

QA	MFG.	PM
NPD	TSV	REP.
MKT	DIR	CUST.

ATLANTIC RESEARCH CORPORATION · 5390 CHEROKEE AVENUE · ALEXANDRIA, VIRGINIA · 22314 · 703-354-3400
TWX 710-832-9828

EQUIPMENT QUALITY REPORT

Dear Customer:

We are trying to manufacture the most reliable products possible. You would do us a great courtesy by completing this form should you experience any problems.

I. Equipment Name_____ Model No._____ Ser. No._____

Customer Firm Name_____ Contact Name_____

Division_____ Title_____

Street Address_____ Telephone( )_____

City, State_____ Zip_____ Country_____

TWX/TLX_____ Prepared By_____

II. Detailed description of problem, malfunctions (use extra sheets if necessary) and any attempts at correcting problem._____

Approximate Hours/Days of Operation to Failure_____

Failure Occurred During: Receiving Insp.___ Cust. Installation____

Field Use____

Prepared By_____

III. Disposition:

A. Field Repair Successful? ___No ___Yes

B. Unit Returned? ___No ___Yes Repair Order No._____

C. Date Received For Repair_____

Date Shipped to Customer_____

D. Cause of Failure_____

E. Corrective Action:_____

_____ Prepared By_____

If repair service is required, please obtain return authorization prior to returning equipment to ARC. Tel. (703) 354-3400 Ext. 542, or TWX 710-832-9828.

Distribution:

QA	MFG.	PM
NPD	TSV	REP.
MKT	DIR	CUST.

ATLANTIC RESEARCH CORPORATION · 5390 CHEROKEE AVENUE · ALEXANDRIA, VIRGINIA · 22314 · 703-354-3400
TWX 710-832-9828

EQUIPMENT QUALITY REPORT

Dear Customer:

We are trying to manufacture the most reliable products possible. You would do us a great courtesy by completing this form should you experience any problems.

I. Equipment Name_____ Model No._____ Ser. No._____

Customer Firm Name_____ Contact Name_____

Division_____ Title_____

Street Address_____ Telephone( ) _____

City, State_____ Zip_____ Country_____

TWX/TLX_____ Prepared By_____

II. Detailed description of problem, malfunctions (use extra sheets if necessary) and any attempts at correcting problem._____

_____

_____

_____

Approximate Hours/Days of Operation to Failure_____

Failure Occurred During: Receiving Insp.___ Cust. Installation____

Field Use____

Prepared By_____

III. Disposition:

A. Field Repair Successful? ___No ___Yes

B. Unit Returned? ___No ___Yes Repair Order No._____

C. Date Received For Repair_____

Date Shipped to Customer_____

D. Cause of Failure_____

_____

_____

E. Corrective Action:_____

_____

_____

_____

_____ Prepared By_____

If repair service is required, please obtain return authorization prior to returning equipment to ARC. Tel. (703) 354-3400 Ext. 542, or TWX 710-832-9828.

Distribution:

QA	MFG.	PM
NPD	TSV	REP.
MKT	DIR	CUST.